

REMARKS

This is in response to the Office Action dated April 17, 2003. In view of the foregoing amendments and following representations, reconsideration is respectfully requested.

Initially, on page 2 of the Office Action, the drawings are objected to under 37 C.F.R. § 1.83(a). In response, proposed corrections of Fig. 2a and Fig. 2b are submitted in order to clarify the relationship between the channels (10, 11), the permeable material (12, 13), the annuli (20), and the plugs (21). Also, "Section A-A" has been removed from Fig. 2a. Note that reference numeral 24 and sectional line A-A are now referred to in the substitute specification. Accordingly, it is submitted that each of the objections to the drawings is now clearly obviated.

Next, on page 4 of the Office Action, the specification is objected to based on a number of minor informalities. Accordingly, the specification and abstract have been reviewed and revised, and a substitute specification and abstract has been prepared. No new matter has been added. Please note that the reference to claims 2-5 has been deleted from the specification and the reference numeral 24 has been described. Furthermore, the trademark "Plexiglas" is now capitalized and accompanied by the generic terminology. In view of the above, it is submitted that the objection to the specification of the present application is now clearly obviated.

Further, to facilitate the Examiner's reconsideration of the application, original claims 1-10 have been canceled and replaced with new claims 11-22. Each of the new claims has been carefully drafted to ensure compliance with the requirements of 35 U.S.C. § 112,

second paragraph. The new claims avoids the language considered objectionable by the Examiner. Also, all reference numerals have been removed from the claims. Therefore, it is submitted that the objections to claims 1-10 are obviated by the cancellation of such claims and the presentation of new claims 11-22.

Next, on page 6 of the Office Action, claim 1 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of copending application no. 10/009,690. However, new independent claims 11 and 17 of the present application now clearly recite several significant features which are not recited in the new independent claims of application no. 10/009,690. Accordingly, in view of the presentation of the new claims in the respective applications, it is submitted that the obviousness-type double patenting rejection, set forth in the previous Office Action, is no longer applicable between the present application and copending application no. 10/009,690.

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Next, on pages 8-10 of the Office Action, the claims are rejected over the prior art as follows:

Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over foye (U.S. Patent No. 3,556,197) in view of Kittilsen et al. (U.S. Patent No. 5,915,455) or Steen et al. (U.S. Patent No. 5,678,623).

It is submitted that the present invention, as defined in the new claims, now clearly patentably distinguishes over the applied references for the following reasons.

The present invention is directed to horizontal casting equipment in which gas and oil can be supplied to a horizontal metal mold in a controlled manner. In particular, the present invention, as defined in new independent claims 11 and 17, requires a plurality of restricting elements (plugs) provided between said permeable wall material and an interior wall of said mold housing so to form a plurality of sectors, and at least two supply channels communicating with each of said sectors so that gas and oil can be separately supplied to each of said sectors and through said permeable material. Accordingly, the supply of the gas and oil can be differentiated around the circumference of the metal. This ensures reduced primary cooling which provides a reduced inverse segregation zone, i.e. a more even chemical composition throughout the cross section of the cast metal.

Foye discloses an apparatus for lubricating a metal mold during solidification. An upper and a lower chamber (18, 27) provide oil to a gap (24) through slots in a gasket (20). The gap surrounds the metal body and is used to spread the oil around the metal body. A person skilled in the metal casting art would recognize that this apparatus could not be used to provide a combination of oil and gas because the gas would ascend in the gap and create a gas pocket at the top of the mold.

Kittilsen discloses horizontal casting apparatus including a mold 10 having a primary cooling water circuit 11 and a secondary cooling water circuit 12. The mold also has an oil ring 19 for supplying oil to lubricate the mold. Also, a transition ring 21 is formed of insulating porous refractory material. A protective gas can be introduced behind the transition ring in order to prevent surface discoloration of the ingot. However, in Kittilsen the oil and protective gas are provided to the hot top and not to the mold. Further, the

supply of oil and gas can not be differentiated around the circumference of the hot top surface. Clearly, it would not have been obvious to employ the Kittilsen method in an apparatus for lubricating the metal in the mold as in the Foye apparatus. Furthermore, there is nothing in the collective teachings of Foye and Kittilsen that could be read on the sectors, as defined in claims 11 and 17.

Steen discloses a "vertical" casting apparatus including means for supplying water, oil and gas. When providing gas in a vertical mold, the gas will float up within the mold and create a ring of gas above the metal. Note, in Steen, the oil is provided prior to the gas. In the present invention, the gas is supplied prior to the oil, i.e. the opposite of that disclosed in Steen. If the teachings of Steen were employed in a horizontal casting operation, the same problems would occur, i.e. a gas pocket would be created at the top of the mold. In the present invention, the gas is supplied to a horizontal metal mold in the solidification area. Also, the gas/oil is supplied to sectors through separate supply channels, thereby making it possible to differentiate the supply of gas and oil. As demonstrated above, none of the prior art references discloses or suggests such an arrangement.

In view of the above, it is submitted that the present application is now clearly in condition for allowance. The Examiner therefore is requested to pass this case to issue.

In the event that the Examiner has any comments or suggestions of a nature necessary to place this case in condition for allowance, then the Examiner is requested to contact Applicant's undersigned attorney by telephone to promptly resolve any remaining matters.

Respectfully submitted,

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